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ABSTRACT

This guide identifies considerations in the organization, operation, and evaluation of secondary and postsecondary vocational education programs. It contains both a vocational program guide and Career Merit Achievement Plan (Career MAP) for precision metal fabrication. The guide contains the following sections: occupational description; program content (curriculum framework and student performance standards); program implementation (student admission criteria, cooperative education, and student organization participation); instructional resources (student reference materials, service manuals, and periodicals); facility design recommendations and safety, maintenance, and liability; suggested equipment list; and professional development (technical updating and teacher standards and related professional organizations and support services). The 13 intended outcomes establish students' proficiency in the following: basic metal fabrication skills; read plans and drawings; measuring and layout operations; describe metals and their properties; operate metalworking machines; metal fabrication operations; gas welding and cutting operations; electric metal-bonding operations; assembly operation; apply geometric form and position control; organize and plan work; practice employability skills; and entrepreneurship. The Career MAP displays student performance standards and documents the level of achievement on the standards for each of the 13 student outcomes. (NLA)

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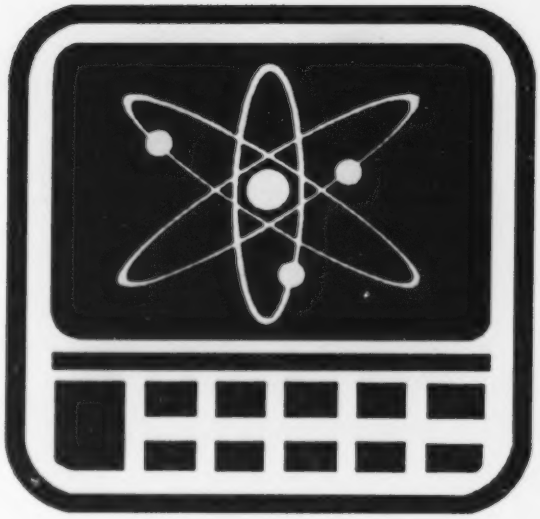

FLORIDA VOCATIONAL PROGRAM GUIDE FOR PRECISION METAL FABRICATION

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INTRODUCTION

Vocational education meets the needs of students desiring to pursue a selected vocation and is designed to provide training that is realistic in meeting present and future employment opportunities. In recent years, applications of science and technology have expanded rapidly, increasing the education and training required of workers. This has made vocational training programs more attractive as an educational option. The new technologies require well-trained workers to carry out both standardized and specialized procedures, and whose training foundation has given them the capacity to keep pace with continuing technology demands.

The Florida Department of Education shares with business and industry the determination to provide opportunities for upward mobility to as many Floridians as possible. Vocational training programs can keep pace with the demands of new industrial patterns and can provide the opportunity for many of our citizens to gain financial stability and an improved sense of self worth. Therefore, it is necessary to create exemplary vocational programs and to make those programs consistent throughout the state.

This Program Guide identifies primary concerns that should be considered in the organization, operation and evaluation of a vocational education program. It has been developed to provide useful information to local school district and community college administrators, instructors, program advisory committees, regional coordinating councils and others charged with the responsibility of offering vocational education programs.

OCCUPATIONAL DESCRIPTION

A principle occupational title is identified for each vocational training program. This title is validated by the United States Department of Labor Dictionary of Occupational Titles (DOT) or other appropriate references. Such references may be the United States Department of Commerce Standard Occupational Classification Manual (SOC), the Occupational Employment Statistics Survey Dictionary (OES), or Vocational Preparation and Occupations (VPO) prepared by the National and State Occupational Information Coordinating Committees. Information obtained from industry advisory committees may also be used to validate the principle occupational title. The job title and code number for this program are listed in the curriculum framework which accompanies this guide.

The United States Department of Labor Dictionary of Occupational Titles (D.O.T.) identifies the job title for this occupational area as follows:

D.O.T. JOB TITLE	D.O.T. CODE
Metal Fabricator - Assembler	809.381-010

The definition (description) for this job title is taken from the D.O.T. for easy reference.

809.381-010 METAL FABRICATOR - ASSEMBLER.

Fabricates and assembles metal products, such as window sashes, casements, doors, awning frames, shells, cases and tubular products as specified by work orders, diagrams and templates, using hand tools, power tools and metalworking machinery. Lays out and marks reference points onto components, using template, rule, square, compass and scale. Operates machines, such as shears, cutoff saws, brakes, punch press, form rolls and drill press to cut and shape components to specified dimensions. Fits and assembles components, using fixtures, hand tools and portable power tools. Operates machines, such as arbor presses, riveting press, brazing machine and resistance-welding machines to complete assembly. May weld components together.

PROGRAM CONTENT

The Division of Vocational, Adult, and Community Education, as required by State Board of Education (**S.B.E.**) **Rule 6A-6.0571**, publishes Vocational Education Program Courses Standards annually. This document specifies the minimum program content for the operation of a vocational training program for the occupational titles listed. Each program identified in the Florida Department of Education Course Code Directory is required to establish course standards. The standards for each vocational offering are comprised of two major components: (1) Curriculum Framework and (2) Student Performance Standards.

Curriculum Framework (CF)

The Curriculum Framework specifies the exact course title, course number, levels of instruction, major course content, laboratory activities, special notes, major course concepts and intended outcomes. The program requirements stipulated in the curriculum framework have been approved by the State Board of Education and are the legal bases for delivery of instruction.

Student Performance Standards (SPS)

The Student Performance Standards are a resource list of job-specific competencies. This list is generated and approved by industry experts and becomes the basis for curriculum development in vocational programs. Local school districts and community colleges must, by law, adopt student performance standards for their vocational programs. They may, at their discretion, adopt the list provided or develop their own as long as there is sufficient content to address each intended outcome. A program may provide instruction beyond the minimum specified in the SPS if desired. The decision to do this should be based on local industry needs. However, the minimum must be presented.

The SPS for secondary level programs contain a third component, course structure. This component specifies the number of courses required for program completion and the content of each course. The courses may be taught in any sequence, but the content may not be changed unless approved by the Division of Vocational, Adult, and Community Education.

The curriculum framework and student performance standards are intended for use as a guide, not a teaching tool. Teachers or curriculum development personnel are expected to develop or select complete curriculum materials for their training programs based on the curriculum framework and student performance standards. Each intended outcome and SPS should be thoroughly analyzed for related cognitive and procedural subskills. The curriculum framework and student performance standards are presented in the following pages.

CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1989

PROGRAM TITLE: Precision Metal Fabrication

CODE NUMBER: Secondary _____ Postsecondary PMT0812

Florida CIP IN48.050400

SECONDARY SCHOOL CREDITS __ COLLEGE CREDITS ____ POSTSECONDARY ADULT VOCATIONAL CREDITS ____

APPLICABLE LEVELS(S): __ 7-9 __ 9-12 X Postsecondary Adult Vocational

____ Postsecondary Vocational X Other 30, 31

CERTIFICATION COVERAGE: SHEET METAL 7 METAL WORK @ 7

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as metal fabricators-assemblers (809.381-010). This program also provides supplemental training for persons previously or currently employed in these occupations.

The course content will include the following: measurement and layout, planning and design, sheetmetal work, structural steel, welding, mechanical fasteners, metal properties, heat treating and metalworking tools.

The course content should also include Principles of Work Environment Readiness (P.O.W.E.R.) skills training in communication, leadership, human relations and employability skills; and safe, efficient work practices.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program. These activities provide instruction in the use of tools, equipment, materials and processes found in the industry. Students are also instructed in the following: measuring and layout tools, bench metal operations, electric metal bonding operations, gas welding and cutting operations, sheetmetal operations, grinding and sharpening tools and metalworking machines.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is the vocational student organization which reinforces classroom instruction by providing communications, leadership, human relations and employability training experiences. It also reinforces specific vocational skills. When provided, these activities are considered an integral part of this program.

The cooperative method of instruction may be utilized for this program. When the cooperative method is offered, the following is required for each student: a training plan signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; and a work

station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal. The student must receive compensation for work performed.

In accordance with Section 233.0695 F.S., the minimum basic skills grade level required for this postsecondary adult vocational program is: Mathematics 8.0, Language 8.0. This grade level number corresponds to a grade equivalent score obtained on a state designated basic skills examination.

The typical length of this program for the average achieving student is 1600 hours.

IV. INTENDED OUTCOMES: After successfully completing this program, the student will be able to:

01. Demonstrate basic metal fabrication skills.
02. Demonstrate ability to read plans and drawings.
03. Perform measuring and layout operations.
04. Describe metals and their properties.
05. Operate metalworking machines.
06. Perform metal fabrication operations.
07. Perform gas welding and cutting operations.
08. Perform electric metal-bonding operations.
09. Perform assembly operation.
10. Demonstrate ability to apply geometric form and position control.
11. Organize and plan work.
12. Demonstrate and practice employability skills.
13. Demonstrate an understanding of entrepreneurship.

STUDENT PERFORMANCE STANDARDS EFFECTIVE DATE: July, 1989

PROGRAM AREA: Industrial SECONDARY NUMBER: _____

PROGRAM TITLE: Precision Metal Fabrication POSTSECONDARY NUMBER: PMT0812

01.0 DEMONSTRATE BASIC METAL FABRICATION SKILLS--The student will be able to:

01.01 Comply with safety and operating rules and practices.
01.02 Maintain a clean and orderly shop.
01.03 Make job-related decimal and fraction calculations.
01.04 Solve job-related problems by adding, subtracting, multiplying and dividing numbers.
01.05 Solve job-related problems operating a hand-held calculator.
01.06 Solve job-related problems using mathematical handbooks, charts and tables.
01.07 Compute feet, inches and yards.
01.08 Use the protractor to measure angles to nearest degree.
01.09 Use the protractor and triangles to draw angles.
01.10 Demonstrate proper use of material handling techniques.
01.11 Solve job-related problems using basic formulas.
01.12 Solve job-related problems using basic geometry.
01.13 Solve job-related problems using basic trigonometry.
01.14 Calculate the amount of material that is required to fabricate project.
01.15 Calculate machine feed and speed by using formulas.
01.16 Calculate set back and bend allowance.

02.0 DEMONSTRATE ABILITY TO READ PLANS AND DRAWINGS--The student will be able to:

02.01 Identify dimensions.
02.02 Identify lists of materials and specifications.
02.03 Identify section views/detail views.
02.04 Disassemble and assemble parts using an exploded view drawing.
02.05 Interpret blueprint abbreviations.
02.06 Identify dimensioning of radii, round holes, fillets and chamfers.
02.07 Identify screw threads and bolt types.
02.08 Apply dimensional tolerances.
02.09 Identify metal fabrication symbols used in blueprints.
02.10 Read and interpret title block information.
02.11 Identify and interpret rivet call outs.
02.12 Identify and interpret weld call outs.
02.13 Identify and interpret general and local notes.
02.14 Describe the use for assembly blueprints and detail blueprints.

03.0 PERFORM MEASURING AND LAYOUT OPERATIONS--The student will be able to:

03.01 Perform basic geometric construction.
03.02 Use marking gages, center punches, scribes, surface gages, squares, dividers, dial indicators, protractors, surfaceplates, depth gages and circumference rules.

03.03 Develop patterns using parallel line, radial line and triangulation.
03.04 Make metal fabrication sketches.
03.05 Read and measure with steel rules.
03.06 Read and measure with micrometers.
03.07 Read and measure with vernier height gages.
03.08 Read and measure with dial calipers.
03.09 Read and measure with universal bevel protractor.
03.10 Measure with sine bars.
03.11 Read and measure with dial indicators.
03.12 Apply parallel bars, angle plates and surface gages to precision measurement operations.
03.13 Apply "v" blocks to precision measurement operations.
03.14 Use gage blocks in establishing measurement.
03.15 Layout work piece using marking gages, center punches, scribes, surface gages, squares, dividers, dial indicators, protractors, surface plates, depth gages and circumference rules.
03.16 Perform flat pattern bracket layouts.
03.17 Perform cone development, construct radial line and use triangulation.

04.0 DESCRIBE METALS AND THEIR PROPERTIES--The student will be able to:

04.01 Describe the steelmaking process.
04.02 Describe the differences between ferrous and nonferrous metals.
04.03 Describe casting, alloys and forging.
04.04 Identify metals such as galvanized iron and steel, aluminum stainless steel, sheetmetal, copper and brass.
04.05 Identify properties of the most common metals.
04.06 Identify and describe common gages, shapes and dimensions of purchased materials.

05.0 OPERATE METALWORKING MACHINES--The student will be able to:

05.01 Identify the purpose of various types of machine shop equipment.
05.02 Identify types of a drill press.
05.03 Operate a drill press utilizing the correct drilling speed.
05.04 Operate a band saw utilizing the correct cutting speed.
05.05 Demonstrate clamping devices for securing stock for drilling.
05.06 Identify types and sizes of drill bits.
05.07 Use portable power saw equipment.
05.08 Use a cutoff or power hacksaw.
05.09 Use electric and air utility grinders.
05.10 Sharpen drill bits.
05.11 Select proper type of abrasive wheels for grinding machines.
05.12 Operate large belt sander.
05.13 Operate power press brake.
05.14 Operate power metal shear.
05.15 Operate various manual brakes.
05.16 Operate power jitterbug shear.
05.17 Operate bench grinders.
05.18 Operate beverly shear.
05.19 Operate unishear.

06.0 PERFORM METAL FABRICATION OPERATIONS--The student will be able to:

- 06.01 Fabricate metal, edges and seams.
- 06.02 Use hand tools to cut, punch and shear metal.
- 06.03 Form sheetmetal using a brake, a folder, rolls and a turning machine.
- 06.04 Join metals using solder, rivets and mechanical fasteners.
- 06.05 Make fixtures as required (Micarta and Mild Steel).
- 06.06 Arrange proper setup in vise using safety devises.
- 06.07 Demonstrate ability to cut various shapes of metal stock.
- 06.08 Demonstrate ability to bend various shapes of metal stock.
- 06.09 Inspect fabricated parts.

07.0 PERFORM GAS WELDING AND CUTTING OPERATIONS--The student will be able to:

- 07.01 Identify welding cylinders, regulators, hoses, pressure gages and torches.
- 07.02 Describe welding equipment safety procedures.
- 07.03 Demonstrate proper flame settings.
- 07.04 Demonstrate basic gas welding skills.
- 07.05 Demonstrate procedures for adjusting and operating the oxyacetylene cutting torch.
- 07.06 Demonstrate freehand and guide cutting of various metal thicknesses.
- 07.07 Setup and operate a plasma arc cutting machine.

08.0 PERFORM ELECTRIC METAL-BONDING OPERATIONS--The student will be able to:

- 08.01 Describe and demonstrate the spot and arc welding process.
- 08.02 Demonstrate basic procedures for safely adjusting and operating an arc welder, selecting a rod, striking and maintaining an arc, welding in various positions and clamping.
- 08.03 Setup and operate a spot welder.
- 08.04 Explain and demonstrate the MIG welding process.
- 08.05 Apply basic procedures for safely adjusting, operating, cleaning and maintaining MIG welding equipment.
- 08.06 Apply basic procedures for safely adjusting and operating a TIG welder, welding in various positions, selecting proper tips and choosing filler metal.

09.0 PERFORM ASSEMBLY OPERATION--The student will be able to:

- 09.01 Identify weld symbols.
- 09.02 Perform required weld preparation.
- 09.03 Assist welder in weld operation.
- 09.04 Identify rivet symbol.
- 09.05 Install proper diameter holes and prepare metal surfaces for riveting.

09.06 Determine whether rivet is to be "shot" or squeezed.
09.07 Perform proper setup and upset rivets.
09.08 Setup and install blind rivets.

10.0 DEMONSTRATE ABILITY TO APPLY GEOMETRIC FORM AND POSITION CONTROL--The student will be able to:

10.01 Identify material condition and perfect form.
10.02 Identify the eleven form characteristics.
10.03 Identify the two position characteristics.
10.04 Identify the seven different tolerance zones.
10.05 Identify datum symbols.
10.06 Identify datum planes.
10.07 Identify datum axis.
10.08 Identify datum centerplane.
10.09 Identify the three plane datum system and multiple datums.
10.10 Identify material condition modifiers.
10.11 Solve bonus tolerance applications.
10.12 Solve datum zone applications.
10.13 Identify tolerance value indicator.
10.14 Identify American National Standards Institute.
10.15 Identify International Standards Institute.

11.0 ORGANIZE AND PLAN WORK--The student will be able to:

11.01 Interpret blueprints and drawings to acquire proper amount of material.
11.02 Requisition proper tools and equipment to fabricate part.
11.03 Develop a project plan.

12.0 DEMONSTRATE AND PRACTICE EMPLOYABILITY SKILLS--The student will be able to:

12.01 Conduct a job search.
12.02 Secure information about a job.
12.03 Identify documents that may be required when applying for a job.
12.04 Complete a job application form correctly.
12.05 Demonstrate competence in job interview techniques.
12.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other persons.
12.07 Identify acceptable work habits.
12.08 Demonstrate knowledge of how to make job changes appropriately.
12.09 Demonstrate acceptable employee health habits.

13.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--
The student will be able to:

13.01 Define entrepreneurship.
13.02 Describe the importance of entrepreneurship to the American economy.
13.03 List the advantages and disadvantages of business ownership.
13.04 Identify the risks involved in ownership of a business.
13.05 Identify the necessary personal characteristics of a successful entrepreneur.
13.06 Identify the business skills needed to operate a small business efficiently and effectively.

PROGRAM IMPLEMENTATION

It is the teacher's responsibility to ensure that students learn how to competently perform the tasks specified in the course objectives. Therefore, the teacher must lead the students through the learning experiences in a course, motivate students, act as a role model for students and, at times, function as a guidance counselor and placement coordinator. This leadership role requires the teacher to participate in many of the activities required for program implementation. The teacher must select the methods of instruction that best apply to students' ability levels, measure student achievement and provide feedback. Key factors that must be considered when implementing this program are addressed below.

TEACHER CHARACTERISTICS

Subject Knowledge

The teacher must be a subject matter expert who is able to implement sound instructional methods and evaluate student performance. He/she must have significant work experience in the industry/vocational field and be able to communicate that knowledge to the students.

Instructional Delivery

The teacher's role in the learning process is to motivate and lead the student as well as impart subject matter knowledge. In order to maximize student learning, the use of a variety of instructional methods is encouraged. Because teaching styles vary greatly, teachers are highly encouraged to "pick and choose" from various methods or to combine methods for maximum benefit to students. Some of the more traditional methods used are lecture, demonstration and small group instruction. Other teaching methods which are suggested for further exploration include individualized self-paced, open-exit/open-entry, contract, computer based and competency based instruction. The focus of Competency Based Vocational Education (CBVE) is to ensure that each student can competently perform tasks specified before progressing to more complex skills.

CONVENTIONAL INSTRUCTIONAL METHODS

A vocational program may require a portion of the instruction to be presented in a standard lecture or controlled demonstration format. These methods of instruction can be easily combined with instructor controlled step-by-step practical exercises. Some instructional activities may dictate that this instructional approach be used to introduce students to hazardous equipment often utilized in vocational training. In most situations, students should be required to perform specified activities to achieve maximum skill competency. If mastery of a task is required, competency based education methods may be more appropriate. However, if the training activity involves an orientation or a seldom performed, non-essential task, conventional instructional methods may be more effective. Teachers are encouraged to use a variety of instructional methods to best meet instructional objectives.

Instructional Development

Teachers often must develop and select their own teaching and curriculum materials. In developing a comprehensive curriculum, instructional objectives based upon both the performance and cognitive domain must be included. When developing curriculum materials, teachers must use the curriculum framework (CF) and student performance standards (SPS) contained in this program guide as a basis. These materials delineate minimum program content which must be presented for an approved vocational training program. However, they are not intended for use as a comprehensive curriculum. Be certain not to adapt the curriculum to available materials, but select only those materials which can be adapted to the curriculum.

Instructional Measurement

Teachers must select testing methods that support the instructional delivery system used. Teachers must be competent to develop, administer and evaluate written and performance type tests.

Student Admissions Criteria

Providing the student the opportunity to successfully complete a vocational education program, in any institution, should be the primary concern of the instructional effort. Therefore, it is very important to direct planning and effort into identifying and selecting students with excellent potential for success in the educational program and in the occupation. The school's primary task is to prepare people for fulltime, entry-level positions as technicians or, in the case of those with more experience, as managers.

The Course Code Directory, specifies grade levels at which occupational programs are offered. Specific student admissions criteria which is required by the State and local educational agencies for the Precision Metal Fabrication training program is illustrated as follows.

SPECIFIC ADMISSIONS CRITERIA

Minimum Age:	As required by state and local policy
Physical Requirements:	None
Special Requirements:	None
Minimum Basic Skills Math Level:	* 8.0
Minimum Basic Skills Language Level:	* 8.0

* This grade level requirement is specified in the Curriculum Framework and is applicable to postsecondary level programs of 450 hours or more only. There is no minimum basic skill requirement for secondary programs.

THE STUDENT PROFILE

Developing a student profile is an important step in program implementation. Attention should focus on student characteristics that can be remediated within a training program, but could create serious impediments to success in the vocational field. Typical of these would be deficiencies in communications and mathematical skills. The basic skill levels can be measured by testing. Test results can then be used to direct the student to more suitable training which matches his or her skill level, or to determine supplemental training which may be required to increase chances for student success.

High school and postsecondary vocational students can be admitted to a vocational program upon request if they meet any specified prerequisites, such as physical or basic skill requirements. Training programs should be accessible to as many students as possible. Training programs are designed to prepare students for employment upon graduation, or serve as prerequisite to a postsecondary program.

The community college can be more selective and establish stringent admission standards. This may be done by assessing applicants or by recruiting potential students who meet the established prerequisite requirements of the training. The program advisory committee can design a profile of the potentially successful student. The profile should contain a

list of qualities, traits and aptitudes that will indicate a higher potential for student success. Acceptable levels for these traits must also be determined. For example, the qualities deserving highest attention, mechanical ability and cognitive aptitude, are those which the educational program itself will not likely be able to influence, although these traits should have considerable weight in establishing the basic profile. Deficiencies in mathematical or communications skills may lend themselves to improvement through related instruction while the student is enrolled in the program. The following example illustrates specific qualities to consider when establishing the student profile:

Mechanic/Technician--Service

- Knowledge of basic tools and equipment used by mechanics/technicians
- Ability to analyze and solve mechanical and technical problems
- Ability to interpret written mechanical/technical materials
- Ability to interpret mechanical/technical drawings
- Mechanical dexterity

Mechanic/Technical Service Management

- Basic application of service
- Business skills
- Ability to work with people
- Communications skills
- Leadership

QUALIFYING AND PRETESTING

Assessing potential students for vocational programs is an integral part of the recruiting process since considerable amounts of time and money will be spent on students entering training. Recruiters must have a good idea of the candidate's basic aptitude. Whoever guides the candidate to the program needs to have knowledge of the student's interests, abilities and experience. These can be measured by a variety of assessment methods, which should be performed upon program entry. The assessment can help determine extent and level of training each individual should receive.

Assessment should determine the level at which the student can read, write, calculate mathmatics and understand the English language. It is appropriate for the program advisory committee and the school to develop some selection criteria based on minimum skill levels. These criteria should remain flexible in order to maximize educational opportunity for all applicants. Additionally, vocational educators must make every effort to serve the variety of "special needs" students and to eliminate sex-bias and stereotyping in all occupational areas.

ADVISORY COMMITTEE

It is imperative that representatives of industry be organized into an advisory committee. Constantly changing technological demands of our society will continue to stimulate changing industrial patterns. Therefore, effective use of program advisory committees is vital to the successful implementation of vocational training programs. Advisory committees provide expert technical advice which is not easily obtainable elsewhere, offer external support of policies and have tremendous public relations potential.

The most effective advisory committees are those whose members have mutual respect for each other's abilities and vested interest in the training program because of their need for trained workers. The program advisory committee is also one of the most effective means of facilitating placement. Its role can be:

- To contact local industry and encourage them to use the school's placement office as a means of filling jobs
- To develop an effective procedure for interviewing and evaluating potential employees suggested by the school
- To assist in gathering accurate and current job information as it becomes available

COUNSELING AND GUIDANCE

Counseling of students serves two purposes. It guides the student into the program and it supports enrolled students on a continuing basis throughout the program. Much day-to-day counseling will be the responsibility of the teacher. The teacher has the most contact with the student and is in a position to detect and correct a problem. Each student will encounter new problems as the program develops. The teacher's job is to work with the student to help identify problems and then strive for solutions. The teacher will provide much of the counseling that focuses on trade knowledge and skills.

The professional counselor cannot be expected to have the subject matter expertise of the primary teacher. The counselor, however, can focus on the student's needs related to other issues such as personal growth, interests and attitudes. The ideal situation will provide at least one counselor with current knowledge of industry standards for career counseling. A useful tool which should be used in the counseling process is the Career Merit Achievement Plan (Career MAP) which presents minimum instructional content keyed to student performance standards. Career MAPs are available for each industrial program area, and can be used to document student achievement, isolate student interests, talents and weaknesses. They are also useful for placement purposes. Information on Career MAPs may be obtained by contacting the Department of Education, Division of Vocational, Adult, and Community Education, (904) 488-0484.

STUDENT PLACEMENT

Implementing an effective placement system is integral to developing a successful vocational training program. **S.B.E. Rule 229.551 (3)(g)** requires 70 percent placement of students who have completed a vocational training program. Although placement is not always a problem, as with students already working in a related occupation, the placement program should place emphasis upon students who are seeking entry-level employment since these students have little or no experience with industry.

The task of the placement program is to locate job openings in the community. The placement coordinator or teacher must know each student's personal aims and interests in addition to the information stated on the achievement record. In many cases, teachers are the best source to match students to job openings because of their contacts with the industry advisory committee. Input concerning employment openings must come from individual business establishments in the community. The placement coordinator should introduce a student to as many suitable job openings as possible. Conversely, employers can then be expected to interview as many qualified candidates as possible.

Cooperative Education

COOPERATIVE EDUCATION APPLICABILITY

Normally, students will complete the entire program as full-time students before obtaining employment. However, there may be situations where students could be allowed to complete part of the program while employed in their occupational areas. At this time it is appropriate for the student to enroll in industrial cooperative education (ICE). Guidelines for this training plan are provided in the "Industrial Cooperative Education Program Guide," published by the Division of Vocational, Adult, and Community Education, Order # IE 508 BK 87.

Industrial cooperative education is a method of instruction designed to prepare students for jobs in the community. This method is a joint effort between the school and the business community. Student trainees receive a combination of instruction in the classroom and related on-the-job training through employment. Learning experiences are jointly planned and supervised by the teacher and the employer. Cooperative education is relevant to the needs of the student preparing for a work role, and will help the student to achieve success and personal satisfaction as the transition is made from school to the constantly changing world of work.

Cooperative education is defined in the Federal Register, Volume 39, number 143, Vocational Education, Section 102.96, as a program ". . . to prepare students for employment, through: (a) providing meaningful work experiences combined with formal education enabling students to acquire knowledge, skills, and appropriate attitudes, (b) removing the artificial barriers which separate work and education, (c) involving educators with employers, creating interaction whereby the needs and problems of both are made known, thereby making it possible for occupational curricula to be revised to reflect current needs in various occupations . . . ."

PURPOSE

Cooperative Education is for persons who, through written cooperative arrangements between the school and employers, receive instruction, including required academic courses and related instruction by alternation of study in school with a job in any industrial occupational field. These two experiences must be planned and supervised by the school and employers so that each contributes to the student's education and employability. Work periods and school attendance may be on alternative half days, full days, weeks or other periods of time to fulfill objectives of the cooperative education program.

GOALS AND OBJECTIVES

The primary goal of the cooperative method of vocational education is to prepare skilled, responsible individuals who can assume a productive role in the community. Specific objectives to meet the primary goal are:

- To prepare individuals for employment, adjustment and advancement in specified occupations or occupational areas (primary objective)
- To provide an understanding of the contribution of work to the social and economic welfare of our nation
- To provide students with an understanding and appreciation of the American free enterprise system
- To foster an awareness of the civic, social and moral responsibilities of individuals to society

- To stimulate students' interest in their chosen occupational fields and provide an understanding of the opportunities in each field
- To provide training that results in increased efficiency in performing job tasks
- To provide curriculum which is sensitive and adaptable to changes in occupational practices and procedures as they are affected by societal, economic, technical and educational developments
- To strive to develop a greater appreciation of the value of specifically trained personnel among employers, employees and consumers
- To reinforce skills learned in the school laboratory
- To provide experiences on tools and equipment not available in the school laboratory
- To supplement and broaden the school curriculum into areas not otherwise available

Student Organization Participation

Vocational student organizations operate pursuant to federal and state laws, which authorize them as viable components of vocational education programs. According to federal regulations, the vocational education program of instruction may include activities of vocational student organizations which are an integral part of the vocational instruction offered and which are supervised by vocational education personnel. The **S.B.E.** Rules authorize vocational student organizations as an integral part of the vocational education program as stated in **S.B.E. 6A-6.064 (7)** and **6A-6.065 (8).**

VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)

VICA is an organization for secondary or postsecondary students enrolled in trade and industrial education programs in high schools, area vocational technical centers and junior and community colleges. It is the only national and international organization for trade and industrial students. The organization is designed to expand and enrich opportunities for leadership, social awareness and civic responsibility in vocational students.

Students who participate in VICA activities are often better prepared for the world of work. They acquire knowledge of the many opportunities available in their chosen careers and become aware of the value of their

contributions to society. They are also given opportunities to develop and utilize their talents and abilities in ways that otherwise would not be available to them.

BENEFITS OF VICA MEMBERSHIP FOR THE STUDENT

Membership in VICA offers the student the opportunity for growth and development in the following areas:

School and Community Service Activities Students in VICA become involved in various school and/or community services. These may include clothing or food collections for the needy, donation of time and service to the elderly and participation in fund raisers or similar activities.

Social Interaction with Fellow Students Activities are also available that offer students time for relaxation and fun. Social activities of this type may be held on a regular basis. They might be held on the school campus during school hours, or off campus after school. More formal functions would include end of the year award banquets or industry/employer appreciation dinner banquets.

Competition in Skill and Leadership Contests VICA offers various contests in all the skill and leadership areas it serves. Often, teachers identify talented students who represent their school in regional competitions. However, any student member of VICA may compete. Instructors should conduct planned contests within their trade areas. This also pertains to leadership areas. First and second place regional winners then move on to the state level contest. The state winners then compete at the national level of the United States Skill Olympics.

INSTRUCTIONAL RESOURCES

STUDENT REFERENCE MATERIALS

Necessary instructional texts or pertinent material should be available for each student to satisfy training objectives. When textbooks are used, the copyright date should be as current as possible.

SERVICE MANUALS

Manuals with current manufacturer's service procedures and specifications should be available. These manuals must be located where students can use them while working in the shop area.

PERIODICALS

Current general and technical magazines and newspapers should be available for student and instructor use.

The following list of suggested resources is organized under each outcome shown in the curriculum framework. These resources have been recommended by instructors and program administrators through statewide surveys.

01.0 DEMONSTRATE BASIC METAL FABRICATION SKILLS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
General Workplace Safety 110/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Machining Safety 110/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Sling and Hoist Safety 110/1.03-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Manually Operated Tools	ROPER WHITNEY COMPANY	text
Metal Work, Technology and Practice Oswald A. Ludwig and Willard J. McCarthy	McKNIGHT PUBLISHING COMPANY	text
Modern Metalworking John R. Walter	GOODHEART-WILLCOX COMPANY, INC.	text
The Shop Tool Manual	BROWN AND SHARPE MANUFACTURING COMPANY	text

02.0 DEMONSTRATE ABILITY TO READ PLANS AND DRAWINGS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Engineering Drawing and Geometry Randolf Phillip Hoelscher and Clifford H. Springer	JOHN WILEY & SONS, INC.	text
Machinery's Handbook E. Oberg, et. al.	INDUSTRIAL PRESS, INC.	text

Machinist's Ready Reference C. Weingarter, comp.	PRAKKEN PUBLICATIONS, INC.	text
The New American Machinist's Handbook Fred H. Colvin	McGRAW HILL BOOK COMPANY	text

03.0 PERFORM MEASURING AND LAYOUT OPERATIONS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Benching Finish Work 111/1.03-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Benching Tools 111/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Dial Indicators and Dial Test Indicators 101/1.06-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Height Gage 101/1.05-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Inside Diameter Micrometer (I D Mic) and Depth Micrometer 101/1.03-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Introduction to Benching 111/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Introduction, Standard Gages 101/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Outside Diameter Micrometer (O D Mic) 101/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text

Vernier Calipers and Dial Calipers 101/1.04-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Bench Work	DELMAR PUBLISHING	text
How to Read, Use, and Care for Micrometers, Vernier and Gages	L. S. STARRETT COMPANY	text

04.0 DESCRIBE METALS AND THEIR PROPERTIES

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Sheet Metal Technology Richard S. Budzik	BOBBS-MERRILL COMPANY	text

05.0 OPERATE METALWORKING MACHINES

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Description and Use of Cutting Tools 201/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Effects of Turning Conditions - Metal Removal 202/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Fixturing 201/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Grinder Components, Controls and Operations 205/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Indroduction to Milling Machines and Milling Tools 203/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Introduction to Grinding and Grinding Wheels 205/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text

Physics of Metal Cutting 202/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Speed, Feed Rate and Depth of Cut in Milling Operations 203/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Drill Press Work	DELMAR PUBLISHING	text
How to Run a Lathe	SOUTH BEND LATHE, INC.	text
Lathe Work	DELMAR PUBLISHING	text
Modern Metalworking John R. Walker	GOODHEART-WILLCOX COMPANY, INC.	text
Precision Surface Grinding Wilkie Brothers Foundation	DELMAR PUBLISHING	text
Sheet Metal Machinery	THE LOCKFORMER COMPANY	text

06.0 PERFORM METAL FABRICATION OPERATIONS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Introduction to the Horizontal Boring Machine 206/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Introduction to the Vertical Turret Lathe 207/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Operation of the Vertical Turret Lathe 207/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text

Operations of the Horizontal Boring Machine 206/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Radial Drill Components, Controls and Tools 208/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Radial Drill Operation 208/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Machine Tool Technology William J. McCarthy and Robert E. Smith	McKNIGHT PUBLISHING COMPANY	text
Milling Machine Work	DELMAR PUBLISHING	text
Sheet Metal Machine Processes C. J. Zinngrabe and F. W. Schumacher	DELMAR PUBLISHING	text

07.0 PERFORM GAS WELDING AND CUTTING OPERATIONS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Introduction to TIG Welding - Terms, Equipment Safety 209/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
The TIG Welding Operation 209/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Basic TIG and MIG Welding J. H. Griffin, E. M. Roden and C. W. Briggs	DELMAR PUBLISHING	text
Oxyacetylene Welding Ronald J. Baird	GOODHEART-WILLCOX COMPANY, INC.	text

08.0 PERFORM ELECTRIC METAL-BONDING OPERATIONS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Introduction to Resistance Welding 211/1.01-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text
Operation of Resistance Spot Welding Machine 211/1.02-A	GREATER CINCINNATI INDUSTRIAL TRAINING CORPORATION	tape/text

09.0 PERFORM ASSEMBLY OPERATION

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE

NONE

10.0 DEMONSTRATE ABILITY TO APPLY GEOMETRIC FORM AND POSITION CONTROL

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE

NONE

11.0 ORGANIZE AND PLAN WORK

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE

NONE

12.0 DEMONSTRATE EMPLOYABILITY SKILLS

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE
Applying for a Job - Instructor's Guide (CE 004 BK 81)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	instructor text
Choosing an Occupation - Instructor's Guide (CE 010 BK 84)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	instructor text
Employability Skills Leader's Guide: In-service Workshop (CE 205 BK 85)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	instructor text
Good Work - Instructor's Guide (CE 018 BK 84)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	instructor text
Job Changes - Instructor's Guide (CE 025 BK 84)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	instructor text
Personal Finances - Instructor's Guide (CE 030 BK 84)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	instructor text
Your Job Search - Instructor's Guide (CE 038 BK 84)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	instructor text
Employability Skills Series (ESS) (CE 001 SS 81)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	module
Applying for a Job - Student Guide (CE 003 BK 79)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	student text

Choosing an Occupation - Student Guide (CE 009 BK 84)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	student text
Employability Skills Participant's Guide: In-service Workshop (CE 074 BK 84)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	student text
Good Work - Student Guide (CE 017 BK 84)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	student text
Job Changes - Student Guide (CE 024 BK 84)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	student text
Personal Finances - Student Guide (CE 029 BK 83)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	student text
Your Job Search - Student Guide (CE 037 BK 84)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	student text
A Guide to Employability Skills Materials (CE 042 BK 85)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	text
ESS for Success (CD 150 BK 84)	FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION	text

13.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP

TITLE, AUTHOR, ORDER#	PUBLISHER	TYPE

NONE

PUBLISHERS' ADDRESSES

BOBBS-MERRILL COMPANY
866 Third Avenue
New York, NY 10022
212-702-2000

BROWN AND SHARPE MANUFACTURING COMPANY
Precision Park
North Kingstown, RI 02852
401-886-2000

DELMAR PUBLISHING
2 Computer Drive West
Albany, NY 12212
518-459-1150

FLORIDA DEPARTMENT OF EDUCATION, DIVISION OF VOCATIONAL EDUCATION
Knott Building
Tallahassee, FL 32399

GOODHEART-WILLCOX COMPANY, INC.
123 West Taft Drive
South Holland, IL 60473
800-323-0440

GREATER CINCINNATI INDUSTRIAL TRAINING CENTER
30 East Central Parkway, Suite 505
Cincinnati, OH 45202
513-241-0750

INDUSTRIAL PRESS, INC.
200 Madison Avenue
New York, NY 10016
212-889-6330

JOHN WILEY & SONS, INC.
605 Third Avenue
New York, NY 10158
212-850-6418

L. S. STARRETT COMPANY
121 Crescent Street
Athol, MA 01331
617-249-3551

McGRAW HILL BOOK COMPANY
1221 Avenue of the Americas
New York, NY 10020
212-512-2000

McKNIGHT PUBLISHING COMPANY
809 West Detweiller
Peoria, IL 61615
800-447-0682

PRAKKEN PUBLICATIONS, INC.
416 Longshore Drive
Ann Arbor, MI 48107
313-769-1211

ROPER WHITNEY COMPANY
2833 Huffman Boulevard
Rockford, IL 61101
815-962-3011

SOUTH BEND LATHE, INC.
400 West Sample Street
South Bend, IN 46625
219-289-7771

THE LOCKFORMER COMPANY
711 Ogden Avenue
Lisle, IL 60532-1336
312-964-8000

FACILITIES

Facility Design Recommendations

Facilities, tools and equipment are essential parts of training programs, and must be designed to meet State program standard requirements and instructional objectives. This section of the Program Guide contains information for setting up classroom and laboratory facilities. Facility design criteria and space requirements are specified in **S.B.E. Section B, Chapter 6A-2.**

TEACHING FACILITIES

The instructional environment should duplicate, as closely as possible, the real-life work environment the student will enter after graduation. The more the school resembles the industrial environment, the easier it will be for the student to make the transition from school to work. Tools, supplies and equipment should conform to local industry standards. The teacher should actively pursue supplemental resources to expose the students to state-of-the-art equipment.

All facilities should include classroom space, as well as space for regular classroom equipment such as audio-visual equipment. Laboratory facilities should be equipped with work stations or workbenches, tables, chairs and special training aids to demonstrate basic principles and theory. They should contain enough tools and equipment to enable several students to work individually on the same learning activity.

UPDATING FACILITIES

To keep pace with technological changes and improvements, facilities must be updated on a continuing basis. When planning facilities, priority must be to provide space which will fulfill changing needs of the instructional program. Buildings should be designed with flexibility to expand in order to accomodate future program changes and to allow for greater ease of facility updating. The program advisory committee should be used to assist the school in establishing priorities for obtaining facilities, tools and equipment. Careful planning and analysis of current and future needs will lead to the establishment of an effective training environment.

SCHOOL FACILITIES

Precision Metal Fabrication Classroom/Laboratory Areas

This section of the program guide provides guidelines for Precision Metal Fabrication program facilities. All vocational programs must meet additional requirements specified in **S.B.E. Section B, Chapter 6 A-2.**

Classroom/laboratory areas should be designed to accommodate oversized machinery, equipment, materials and holding tables. Each area should be equipped with special lighting, as necessary. The area should provide oversized openings equipped with service entry doors to accommodate the movement and transporting of oversized equipment, materials and products.

The laboratory should include electrical outlets providing 110 volts at each work station. Electrical outlets should be permanently mounted to the work station benches. Additional electrical outlets should be installed along the walls and in the center areas of the laboratory. Electrical outlets in the center areas should be mounted on posts between the ceiling and work stations or on pull down extension systems. Special electrical wiring may be required to supply power requirements of specialized equipment. All electrical service must be installed according to local building code requirements.

CLASSROOM/LABORATORY FACILITIES

Space requirements for **new** facility construction for this program are specified in **S.B.E. Rule 6A-2.032** as shown below.

NEW FACILITIES PRECISION METAL FABRICATION	
Occupant Design Stations	20
Net Square Feet Per Occupant	
Minimum	108
Normal	114
Maximum	119
Total Net Square Feet	
Minimum	2160
Normal	2280
Maximum	2380

WORK STATION ARRANGEMENT

The arrangement of work stations and specialized equipment depends upon the general layout of the facilities, but careful consideration must be given to convenience to entrances and exits, easy movement among work stations and tool/storage areas. The area should have a counter convenient to work stations. Overall layout of the facility should be planned so that the location of entrances and exits permits a logical flow of work in progress. One of the most critical factors in planning a facility is the arrangement of work stations to obtain a safe, efficient traffic pattern.

ADDITIONAL FACILITY CONSIDERATIONS

Training Stations

Training stations and live work areas must be available in the type and number required to meet program goals and performance objectives.

Instructional Area

A classroom or designated area of the laboratory should be available for lecture, instruction, viewing audio visual materials and other nonshop activities.

Personal Tool/Equipment Storage Area

A secure storage room or area should be provided, with enough shelf space for student supplies/tool boxes and floor space for equipment.

General Storage

Storage areas for tools, parts, supplies and machines must be sufficient to support the activities outlined in the program goals and performance objectives.

Office Space

An area separate from the classroom and laboratory should be available and convenient for use by the instructor(s) as an office.

Maintenance

A regular facilities maintenance program must be implemented to ensure that equipment and facilities are safe and usable to meet instructional needs.

Housekeeping

The classroom, laboratory and support area(s) must be kept clean and orderly.

Ventilation

A fume/dust removal system should be in place and operable. When appropriate, heating and cooling systems should be used to provide sufficient comfort for learning. Ventilation requirements are stated in **S.B.E. Rule 6A-2.066.**

First Aid

A first aid station must be in place, well marked and complete with appropriate supplies.

Support Facilities

Restrooms, clean-up areas and lockers convenient to the shop should be available for students.

Safety

The facilities must meet all Occupational Safety and Health Administration (OSHA) safety standards, where applicable.

Facility Evaluation

The program advisory committee should be asked to conduct an annual evaluation of the facilities to insure the program's continuing capability to meet instructional objectives.

Safety, Maintenance and Liability

SAFETY

S.B.E. Rule 6A-2.097

The Florida State Board of Education establishes rules for the operation of public schools. **Part III, Section B, Chapter 6A-2** of the State Board of Education Rules contains the standards for existing educational facilities. Subsections deal with the entire school facility in regard to such topics as electrical equipment, flammable materials, ventilation, fire safety, storage and illumination. Subsection 6A-2.097 contains safety regulations pertaining to vocational classes.

The statute requires 100 percent protection of every student and teacher participating in laboratory work wherein the type of activities listed in the statute above are conducted. This will include: demonstration by teachers or students, students and teachers present in a room or laboratory when students are engaged in make-up work or project work, and when anyone is using tools for construction or repair work involving the shaping or cutting of any solid materials.

Rules and regulations for an eye protection program should be organized and distributed to teachers, students and school personnel. Safety devices should be worn by those participating in the activity and by those who are observers or who may be in close proximity.

Marking of Hazardous Areas

Floors, walls, posts, stationary objects, machinery and equipment should be properly painted, marked, coded or identified, according to recommended safety practices of OSHA, the school board and industry.

Emergency Procedure For Injuries

The following procedures are recommended in the event of an injury or sudden illness in a student:

- Refer to the red "fire or medical emergency" signs posted in appropriate areas.
- Provide immediate first aid if so qualified.
- Notify appropriate personnel to advise them of the problem. They can also contact emergency trained personnel on campus.
- A conscious person has the right to refuse treatment and/or transportation to a medical facility.
- Advise students that they will be financially responsible for ambulance and emergency care.
- The paramedics will assume patient care upon arrival.
- If emergency transportation is not indicated, the student may spend time at the clinic, be allowed to go home or go to a medical facility.
- Be sure to complete the appropriate student injury form for any and all accidents or sudden illness.

MAINTENANCE

Schools should have the necessary facilities for routine maintenance. Special maintenance requirements for this program concern the hand and power tools and machines. Arrangements must be made to accomplish routine and non-routine maintenance of hand and power tools and cutting and shaping machines. Arrangements can be made through the school's shop or an outside agency.

VOCATIONAL TEACHER LIABILITY

Liability of Teacher and School Board

Negligence of vocational education teachers can cause unnecessary injury, and may result in teacher and school district liability. Vocational teachers are recommended to carry personal liability insurance. To reduce the risk of liability and injuries, the following suggestions are provided.

- Follow accepted policies of the school board.
- Do not allow students to use equipment or tools which have not been approved by the administration and Board of Education.
- Establish safety rules and enforce them.
- Do not leave the shop/laboratory while students are working.
- Do not permit non-enrolled students to use the shop/laboratory.
- Do not allow students to use machines or tools for which instruction has not been given.
- Do not approve unsupervised student activities inside or outside the shop/laboratory.
- Prepare accident forms for all accidents.
- Regularly inspect the workplace and equipment for defects or potential hazards and maintain documentation of unserviceable or hazardous items.
- Consider age, maturity, skill and ability of students when providing instruction and supervision.
- Adminster safety tests to students upon completion of the demonstration of a specific machine, tool or process and keep documentation on file in your office.
- Require all students to wear eye protection devices, when appropriate, for laboratory activities.

SUGGESTED EQUIPMENT LIST

General Classroom Equipment

DESCRIPTION

Chalkboard

Bulletin board

Bookcases

Cabinet-storage

Student study stations

Audio-visual equipment as needed

Laboratory Tools and Equipment

These tools and items of equipment are normally used in this program. Equipment items are listed under each outcome, corresponding to the curriculum framework. Consumable supplies should be readily available to assure continuous instruction. Consumable supplies such as rivets and solder are not contained in the equipment list.

01.0 DEMONSTRATE BASIC METAL FABRICATION SKILLS

DESCRIPTION

Aprons, shop
Broom, push, 24 in.
Cabinet, storage, for flammables
Can, mineral spirits, 5-gallon
Containers/safety cans, oily rags
Glasses, safety
Gloves, material handling
Goggles, safety

Measuring tapes, steel
Pans, dust
Rules, folding
Table brush, 12 in., utility brush
Workbenches, steel top, with vises

02.0 DEMONSTRATE ABILITY TO READ PLANS AND DRAWINGS

DESCRIPTION

Cabinet, metal, storage, 2-door
Calculators
Compasses, 6 in.
Drawing boards
Protractors
Scales, 12 in.
Shelves, storage, for books
Triangles, plastic, 45-degree

03.0 PERFORM MEASURING AND LAYOUT OPERATIONS

DESCRIPTION

Awls, scratch
Base indicators, magnetic
Bevels, T, adjustable
Cabinets, storage, steel
Calipers, dial, 8 in.
Calipers, inside, 6 in.
Calipers, outside, 6 in.
Circumference rule
Dividers, 6 in.
Finders, center
Finders, edge, wigglers, set
Gage, American standard, wire
Gage, U.S. standard
Gages, height
Gages, marking
Gages, radius/fillet, set
Gages, surface
Hammers, ball-peen, 8 oz.
Knives, razors
Levels
Lines, chalk
Metric rule

Micrometers, 1 in.
Plumb bobs
Punches, center
Punches, hand
Punches, prick
Scales, hook, 6 in.
Scribes, metal
Sets, JO-blocks
Sets, V blocks
Sets, angle plates
Sets, dial indicator
Sets, measuring
Sets, parallel blocks
Sets, trammel points
Sine bar
Squares, combination
Squares, common (carpenter's)
Squares, steel framing
Straightedges
Surface plate, 24 x 36
Table, combination, rotary
Tool boxes, machinist's
Vises, steel, bench top

04.0 DESCRIBE METALS AND THEIR PROPERTIES

DESCRIPTION

NONE

05.0 OPERATE METALWORKING MACHINES

DESCRIPTION

Anvils 84 lb. / 30 lb.
Bar folder
Bender, diacro
Bender, hossfeld
Box, pan brake, 24 in.
Box, pan brake, 48 in.
Brakes, standard, hand
Chisels, cold, flat
Clamps, 'C'
Combination rotary machine

Dolly, hand
Drill press
Drills, electric
Easy edger
Files, flat
Files, half-round
Grinder sander, disc
Grinder, bench
Grinder, surface
Grinder, tool
Hacksaw, pistol grip
Hacksaw, power
Hammer, sledge, 4 lbs.
Hammers, tinner's
Iron worker, 42 in.
Lathe, metalworking, 10 x 30
Lathe, metalworking, 15 x 50
Lock former, power
Mallets, wooden
Milling machine, vertical
Pliers, vise grip
Punches, button
Rolls, slip form, 36 in.
Sander, belt/disc
Saw, band
Saw, band, metal cutting, 20 in.
Saw, metal cut off
Sets, socket
Shear, beverly
Shears, power, unishear
Shears, squaring, 36 in.
Snips, bulldog
Stake, table, sheet metal
Tab notcher
Tool cabinet, portable, with hand tools
Vacuum cleaner
Welder, spot
Wrenches, adjustable
Wrenches, allen
Wrenches, box
Wrenches, combination
Wrenches, open-end

06.0 PERFORM METAL FABRICATION OPERATIONS

DESCRIPTION

Bolt cutter
Drill bits, assorted
Drill, 1/2 inch, pedestal press
Drill, 3/8 inch, portable, electric or pneumatic
Drill, 1/4 inch, portable
Extension cords
Fastener bin
File cards
Files, smooth cut
Level, spirit, 4 in.
Lever punch, hand
Pop rivet gun
Rivet sets
Saw, hole
Screwdrivers, flat blade
Screwdrivers, phillips
Seam sets
Seamer (tongs), hand
Shears, bulldog
Shears, hand, electric
Snips, cutting, aviation, left-hand
Snips, cutting, aviation, right-hand
Soldering iron
Wrench pipe
Wrenches, adjustable

07.0 PERFORM GAS WELDING AND CUTTING OPERATIONS

DESCRIPTION

Bench, welding/cutting
Brushes, wire
Buffer
Cabinet, storage, welding rod
Punch, whitney
Soldering coppers
Soldering furnace
Welding aprons
Welding clamps
Welding gloves
Welding sets, oxyacetylene
Welding shields

08.0 PERFORM ELECTRIC METAL-BONDING OPERATIONS

DESCRIPTION

Electrode heater or oven
Grinder, electric, hand
Hammer, chipping, welder's
Pipe cutter
Sandblaster
Welder, AC/DC, 250 amp
Welder, TIG, 250 amp
Welder, plasma arc, pac 3
Welder, wire feed, 200 amp
Welding booth with protection screens
Welding helmets

09.0 PERFORM ASSEMBLY OPERATION

DESCRIPTION

NONE

10.0 DEMONSTRATE ABILITY TO APPLY GEOMETRIC FORM AND POSITION CONTROL

DESCRIPTION

NONE

11.0 ORGANIZE AND PLAN WORK

DESCRIPTION

NONE

12.0 DEMONSTRATE EMPLOYABILITY SKILLS

DESCRIPTION

NONE

13.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP

DESCRIPTION

NONE

PROFESSIONAL DEVELOPMENT

Teacher Technical Updating

Technical updating workshops are scheduled periodically throughout the State, usually in the summer months. Teachers should take advantage of the opportunity to attend the metal fabrication technical update workshops when they are held. All instructional staff are encouraged to participate in as many training opportunities as possible.

Teachers should seek opportunities with local companies to maintain currency with industry trends. During periods when school is not in session, teachers are encouraged to make arrangements to return to industry for suitable involvement in their area of expertise.

Membership in professional associations offers vocational educators an enormous range of opportunities for working together to strengthen the field and to develop personal competence and satisfaction in work. The associations have similar goals and activities. They seek excellence in program content by means of joint efforts among members, communications that keep members current, forums for the discussion of issues in the field, useful and stimulating publications and sound professional growth experiences at local, state, regional and national meetings and annual conventions. They are concerned with increasing public understanding and support of the field. Teachers are encouraged to maintain affiliation with professional organizations. A list of professional organizations follows this section of the guide.

Teacher Standards

As a prerequisite to certification, teachers must have the required years of experience in the appropriate technical field as defined in the certification standards. For the Precision Metal Fabrication program, the requirements are six years continuous experience in metal fabrication. The teacher is then judged qualified to teach upon meeting one of the following criteria: (1) regular or temporary Florida teacher's certificate with appropriate coverage, (2) Approval of local school board consistent with adopted school policy or (3) regular or temporary Florida teacher's certificate with other than appropriate coverage (has met all occupational experience requirements prescribed as a prerequisite to appropriate certification and has been approved by the school board to teach

out-of-field.) Refer to the Curriculum Framework for this program to determine the appropriate occupational specialization coverage required for certification.

Instructional staff must have technical competency and meet all State and local requirements for certification. Instructors should hold current, nationally recognized certification in the subject areas taught, if awarded. Beginning teachers must be enrolled in the State Beginning Teacher Program.

A systematic method of obtaining "substitute" instructors, approved by the school board, should be used to assure instructional continuity. An orientation session for substitutes should be held on a regular basis. The substitute should be a competent instructor in the occupational area and specific competencies taught.

Professional Organizations and Support Services

EDUCATION ORGANIZATIONS

AMERICAN VOCATIONAL ASSOCIATION (AVA)
1410 King Street
Alexandria, VA 22314
800-826-9972

FLORIDA ASSOCIATION FOR TRADE AND INDUSTRIAL EDUCATION, INC. (FATIE)
Florida Department of Education
Industrial Education - Vocational Division
Knott Building
Tallahassee, FL 32399
904-488-0484

FLORIDA VOCATIONAL ASSOCIATION (FVA)
1420 North Paul Russell Road
Tallahassee, FL 32399
904-878-6860

FLORIDA VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)
Florida Department of Education
Knott Building
Tallahassee, FL 32399
904-488-0484

TRADE ORGANIZATIONS

This list contains trade associations and technical societies. Many offer training programs of some sort, either directly or through their member companies. Specific details should be requested in writing.

AMERICAN IRON & STEEL INSTITUTE
1000 16th Street Northwest
Washington, DC 20036-5705
202-452-7100

INSTITUTE OF SCRAP IRON & STEEL, INC.
1627 K Street Northwest
Washington, DC 20006-1702
202-466-4050

NATIONAL TOOLING & MACHINING ASSOCIATION
9300 Livingston Road
Fort Washington, MD 20744-4998
301-248-6200

INTERNATIONAL ASSOCIATION OF BRIDGE,
STRUCTURAL & ORNAMENTAL IRON WORKERS
1750 New York Avenue Northwest
Washington, DC 20006-5301
202-383-4800

METAL POLISHERS, BUFFERS, PLATERS AND
ALLIED WORKERS INTERNATIONAL UNION
5578 Montgomery Road
Cincinnati, OH 45212-1849
513-531-2500

INTERNATIONAL ASSOCIATION SHEET METAL WORKERS
1750 New York Avenue Northwest
Washington, DC 20006-5301
202-783-5880

UNITED STEELWORKERS OF AMERICA
5 Gateway Center
Pittsburgh, PA 15222-0000
412-562-2400

FL88CD18

019320
proposal #018858

CAREER MERIT ACHIEVEMENT PLAN (CAREER MAP)

PRECISION METAL FABRICATION

(IN48.050400)

State of Florida

An affirmative action/equal opportunity employer

DEPARTMENT OF EDUCATION
Betty Castor, Commissioner of Education

DIVISION OF VOCATIONAL, ADULT AND COMMUNITY EDUCATION
Robert S. Howell, Director

DEVELOPED BY:
University of South Florida
Department of Adult and Vocational Education

INDUSTRY-BASED PARTNERSHIP PROGRAMS: The State of Florida is committed to the development of industry-based partnership programs, designed by education and industry to respond to industry's demand for a highly skilled work force.

ACKNOWLEDGEMENTS

PARTNERSHIP WITH INDUSTRY

The following industry representatives are recognized for their valuable contributions to the identification and validation of the precision metal fabrication competencies reflected in this MAP:

Mr. Steve Krischon, Metal Industries
Mr. W. Krusen, General Engineering and Machine Co., Inc.
Mr. John Platt, Sheet Metal Supervisor, Metal Industries
Mr. Dave Gisman, Owner, Palm Beach Machine and Tool Company

For further information, contact
Bureau of Vocational Program and Staff Development
Division of Vocational, Adult, and Community Education
Department of Education
Knott Building
Tallahassee, FL 32399

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THIS MERIT ACHIEVEMENT PLAN RECORDS THE PRECISION METAL FABRICATION ACHIEVEMENTS OF:

Student's Name _____

Student ID Number _____

Student's Address _____

_____

Initial Instructor _____

School _____

Date Started _____

PRIMARY JOB TITLE(S) FOR PRECISION METAL FABRICATION

- Metal Fabricators-Assemblers (DOT#809.381-010)

Program completers qualify for the primary job title(s) listed above. Related job titles may be added based on those job titles found in industry and/or the Dictionary of Occupational Titles.

OVERVIEW

This Career MAP includes the competencies required for entry into the field of precision metal fabrication. Business and industry representatives have recommended that students in this field master these competencies in order to become employable. Local education agencies (LEAs) may adapt these competencies to meet their workforce needs.

PURPOSE OF THE MAP

The purposes of the MAP are: to display the student performance standards (SPS) required by the LEA and to document the level of achievement on student performance standards that the student demonstrates.

HOW TO USE THE MAP

Administrator and Instructor. The administrator and instructor can use Career MAPs in curriculum planning, program updating and improvement and teacher recruitment, selection and updating. If the LEA changes or adds student performance standards, the revised or additional student performance standards should be included in the blank boxes that appear within each intended outcome or at the end of this MAP.

Instructor. The instructor can use Career MAPs to keep track of student progress on student performance standards. By periodically reviewing the ratings on student performance standards, the instructor can identify a student's strengths and weaknesses and, on that basis, identify the skills for which the student needs remedial instruction or advanced training. The MAP can also be useful in student counseling and evaluation.

Co-op Instructor/Employer. The employer who sponsors a co-op program should use the Career MAP for keeping a record of the student's performance on appropriate standards. The MAPs will also help the co-op instructor/employer in counseling and evaluating the student.

Student. The student may use the MAP to show potential employers the performance standards he or she has mastered. In order to present a complete record, the student should encourage the instructor/co-op employer to rate his or her level of achievement on all the appropriate student performance standards and to fill in the verification form/cooperative work experience page in the back of this MAP.

Employer. The MAP shows an employer the student performance standards mastered by the student (a prospective employee) and the proficiency level achieved on each student performance standard. This information can help the employer make decisions about hiring, job assignments and job-training needs.

RATING STUDENT PERFORMANCE STANDARDS

Ratings on student performance standards should be based upon business/industrial performance standards. The evaluator observes and evaluates student performance as he or she would in the role of the employer or supervisor.

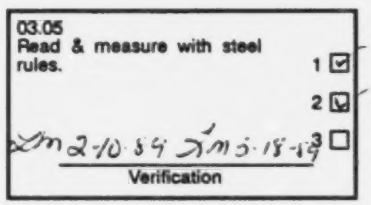
For each skill listed the learner receives a rating of 1, 2 or 3. Each rating indicates a particular level of achievement:

1 = Learner demonstrates knowledge and understanding of this student performance standard, but is not yet able to apply that knowledge or understanding.

2 = Learner performs this student performance standard satisfactorily with only periodic supervision.

3 = Learner performs this student performance standard satisfactorily without supervision.

Whenever a performance standard is demonstrated, the instructor checks the appropriate rating box (1, 2 or 3) and initials and dates the verification line. If the student later demonstrates a higher level of achievement on a performance competency, the instructor crosses out the old level, checks the higher level and then enters his or her initials and the new date on the verification line, as shown in the following example:



NOTE: A student performance standard without a checked rating indicates that the learner has not mastered the standard from lack of either ability, time, opportunity or need (the student's area of specialization may not have required it).

01.0 DEMONSTRATE BASIC METAL FABRICATION SKILLS.

01.01 Comply with safety & operating rules & practices. 1 ☐ 2 ☐ 3 ☐ Verification	01.02 Maintain a clean & orderly shop. 1 ☐ 2 ☐ 3 ☐ Verification	01.03 Make job-related decimal & fraction calculations. 1 ☐ 2 ☐ 3 ☐ Verification
01.04 Solve job-related problems by adding, subtracting, multiplying & dividing numbers. 1 ☐ 2 ☐ 3 ☐ Verification	01.05 Solve job-related problems operating a hand-held calculator. 1 ☐ 2 ☐ 3 ☐ Verification	01.06 Solve job-related problems using mathematical handbooks, charts & tables. 1 ☐ 2 ☐ 3 ☐ Verification
01.07 Compute feet, inches & yards. 1 ☐ 2 ☐ 3 ☐ Verification	01.08 Use the protractor to measure angles to nearest degree. 1 ☐ 2 ☐ 3 ☐ Verification	01.09 Use the protractor & triangles to draw angles. 1 ☐ 2 ☐ 3 ☐ Verification
01.10 Demonstrate proper use of material handling techniques. 1 ☐ 2 ☐ 3 ☐ Verification	01.11 Solve job-related problems using basic formulas. 1 ☐ 2 ☐ 3 ☐ Verification	01.12 Solve job-related problems using basic geometry. 1 ☐ 2 ☐ 3 ☐ Verification
01.13 Solve job-related problems using basic trigonometry. 1 ☐ 2 ☐ 3 ☐ Verification	01.14 Calculate the amount of material that is required to fabricate project. 1 ☐ 2 ☐ 3 ☐ Verification	01.15 Calculate machine feed & speed by using formulas. 1 ☐ 2 ☐ 3 ☐ Verification
01.16 Calculate set back & bend allowance. 1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

PRECISION METAL FABRICATION

02.0 DEMONSTRATE ABILITY TO READ PLANS AND DRAWINGS.

02.01 Identify dimensions. 1 ☐ 2 ☐ 3 ☐ Verification	02.02 Identify lists of materials & specifications. 1 ☐ 2 ☐ 3 ☐ Verification	02.03 Identify section views/ detail views. 1 ☐ 2 ☐ 3 ☐ Verification
02.04 Disassemble & assemble parts using an exploded view drawing. 1 ☐ 2 ☐ 3 ☐ Verification	02.05 Interpret blueprint abbreviations. 1 ☐ 2 ☐ 3 ☐ Verification	02.06 Identify dimensioning of radii, round holes, fillets & chamfers. 1 ☐ 2 ☐ 3 ☐ Verification
02.07 Identify screw threads & bolt types. 1 ☐ 2 ☐ 3 ☐ Verification	02.08 Apply dimensional tolerances. 1 ☐ 2 ☐ 3 ☐ Verification	02.09 Identify metal fabrication symbols used in blueprints. 1 ☐ 2 ☐ 3 ☐ Verification
02.10 Read & interpret title block information. 1 ☐ 2 ☐ 3 ☐ Verification	02.11 Identify & interpret rivet call outs. 1 ☐ 2 ☐ 3 ☐ Verification	02.12 Identify & interpret weld call outs. 1 ☐ 2 ☐ 3 ☐ Verification
02.13 Identify & interpret general & local notes. 1 ☐ 2 ☐ 3 ☐ Verification	02.14 Describe the use for assembly blueprints & detail blueprints. 1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

03.0 PERFORM MEASURING AND LAYOUT OPERATIONS.

03.01 Perform basic geometric construction. 1 ☐ 2 ☐ 3 ☐ Verification	03.02 Use marking gages, center punches, scribes, surface gages, squares, dividers, dial indicators, protractors, surfaceplates, depth gages & circumference rules. 1 ☐ 2 ☐ 3 ☐ Verification	03.03 Develop patterns using parallel line, radial line & triangulation. 1 ☐ 2 ☐ 3 ☐ Verification
03.04 Make metal fabrication sketches. 1 ☐ 2 ☐ 3 ☐ Verification	03.05 Read & measure with steel rules. 1 ☐ 2 ☐ 3 ☐ Verification	03.06 Read & measure with micrometers. 1 ☐ 2 ☐ 3 ☐ Verification
03.07 Read & measure with vernier height gages. 1 ☐ 2 ☐ 3 ☐ Verification	03.08 Read & measure with dial calipers. 1 ☐ 2 ☐ 3 ☐ Verification	03.09 Read & measure with universal bevel protractor. 1 ☐ 2 ☐ 3 ☐ Verification
03.10 Measure with sine bars. 1 ☐ 2 ☐ 3 ☐ Verification	03.11 Read & measure with dial indicators. 1 ☐ 2 ☐ 3 ☐ Verification	03.12 Apply parallel bars, angle plates & surface gages to precision measurement operations. 1 ☐ 2 ☐ 3 ☐ Verification
03.13 Apply "v" blocks to precision measurement operations. 1 ☐ 2 ☐ 3 ☐ Verification	03.14 Use gage blocks in establishing measurement. 1 ☐ 2 ☐ 3 ☐ Verification	03.15 Layout work piece using marking gages, center punches, scribes, surface gages, squares, dividers, dial indicators, etc. 1 ☐ 2 ☐ 3 ☐ Verification
03.16 Perform flat pattern bracket layouts. 1 ☐ 2 ☐ 3 ☐ Verification	03.17 Perform cone development, construct radial line & use triangulation. 1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

PRECISION METAL FABRICATION

04.0 DESCRIBE METALS AND THEIR PROPERTIES.

04.01 Describe the steelmaking process. 1 ☐ 2 ☐ 3 ☐ Verification	04.02 Describe the differences between ferrous & nonferrous metals. 1 ☐ 2 ☐ 3 ☐ Verification	04.03 Describe casting, alloys & forging. 1 ☐ 2 ☐ 3 ☐ Verification
04.04 Identify metals such as galvanized iron & steel, aluminum stainless steel, sheetmetal, copper & brass. 1 ☐ 2 ☐ 3 ☐ Verification	04.05 Identify properties of the most common metals. 1 ☐ 2 ☐ 3 ☐ Verification	04.06 Identify & describe common gages, shapes & dimensions of purchased materials. 1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

05.0 OPERATE METALWORKING MACHINES.

05.01 Identify the purpose of various types of machine shop equipment. 1 ☐ 2 ☐ 3 ☐ Verification	05.02 Identify types of a drill press. 1 ☐ 2 ☐ 3 ☐ Verification	05.03 Operate a drill press utilizing the correct drilling speed. 1 ☐ 2 ☐ 3 ☐ Verification
05.04 Operate a band saw utilizing the correct cutting speed. 1 ☐ 2 ☐ 3 ☐ Verification	05.05 Demonstrate clamping devices for securing stock for drilling. 1 ☐ 2 ☐ 3 ☐ Verification	05.06 Identify types & sizes of drill bits. 1 ☐ 2 ☐ 3 ☐ Verification
05.07 Use portable power saw equipment. 1 ☐ 2 ☐ 3 ☐ Verification	05.08 Use a cutoff or power hacksaw. 1 ☐ 2 ☐ 3 ☐ Verification	05.09 Use electric & air utility grinders. 1 ☐ 2 ☐ 3 ☐ Verification

05.10 Sharpen drill bits. 1 ☐ 2 ☐ 3 ☐ Verification	05.11 Select proper type of abrasive wheels for grinding machines. 1 ☐ 2 ☐ 3 ☐ Verification	05.12 Operate large belt sander. 1 ☐ 2 ☐ 3 ☐ Verification
05.13 Operate power press brake. 1 ☐ 2 ☐ 3 ☐ Verification	05.14 Operate power metal shear. 1 ☐ 2 ☐ 3 ☐ Verification	05.15 Operate various manual brakes. 1 ☐ 2 ☐ 3 ☐ Verification
05.16 Operate power jitterbug shear. 1 ☐ 2 ☐ 3 ☐ Verification	05.17 Operate bench grinders. 1 ☐ 2 ☐ 3 ☐ Verification	05.18 Operate beverly shear. 1 ☐ 2 ☐ 3 ☐ Verification
05.19 Operate unishear. 1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

06.0 PERFORM METAL FABRICATION OPERATIONS.

06.01 Fabricate metal, edges & seams. 1 ☐ 2 ☐ 3 ☐ Verification	06.02 Use hand tools to cut, punch & shear metal. 1 ☐ 2 ☐ 3 ☐ Verification	06.03 Form sheetmetal using a brake, a folder, rolls & a turning machine. 1 ☐ 2 ☐ 3 ☐ Verification
06.04 Join metals using solder, rivets & mechanical fasteners. 1 ☐ 2 ☐ 3 ☐ Verification	06.05 Make fixtures as required (Micarta & Mild Steel). 1 ☐ 2 ☐ 3 ☐ Verification	06.06 Arrange proper setup in vise using safety devises. 1 ☐ 2 ☐ 3 ☐ Verification

PRECISION METAL FABRICATION

06.07 Demonstrate ability to cut various shapes of metal stock. 1 ☐ 2 ☐ 3 ☐ Verification	06.08 Demonstrate ability to bend various shapes of metal stock. 1 ☐ 2 ☐ 3 ☐ Verification	06.09 Inspect fabricated parts. 1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

07.0 PERFORM GAS WELDING AND CUTTING OPERATIONS.

07.01 Identify welding cylinders, regulators, hoses, pressure gages & torches. 1 ☐ 2 ☐ 3 ☐ Verification	07.02 Describe welding equipment safety procedures. 1 ☐ 2 ☐ 3 ☐ Verification	07.03 Demonstrate proper flame settings. 1 ☐ 2 ☐ 3 ☐ Verification
07.04 Demonstrate basic gas welding skills. 1 ☐ 2 ☐ 3 ☐ Verification	07.05 Demonstrate procedures for adjusting & operating the oxyacetylene cutting torch. 1 ☐ 2 ☐ 3 ☐ Verification	07.06 Demonstrate freehand & guide cutting of various metal thicknesses. 1 ☐ 2 ☐ 3 ☐ Verification
07.07 Setup & operate a plasma arc cutting machine. 1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

08.0 PERFORM ELECTRIC METAL-BONDING OPERATIONS.

08.01 Describe & demonstrate the spot & arc welding process. 1 ☐ 2 ☐ 3 ☐ Verification	08.02 Demonstrate basic procedures for safely adjusting & operating an arc welder, selecting a rod, striking & maintaining an arc, welding positions & clamping. 1 ☐ 2 ☐ 3 ☐ Verification	08.03 Setup & operate a spot welder. 1 ☐ 2 ☐ 3 ☐ Verification
08.04 Explain & demonstrate the MIG welding process. 1 ☐ 2 ☐ 3 ☐ Verification	08.05 Apply basic procedures for safely adjusting, operating, cleaning & maintaining MIG welding equipment. 1 ☐ 2 ☐ 3 ☐ Verification	08.06 Apply basic procedures for safely adjusting & operating a TIG welder, welding in various positions, selecting proper tips & choosing filler metal. 1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

09.0 PERFORM ASSEMBLY OPERATION.

09.01 Identify weld symbols. 1 ☐ 2 ☐ 3 ☐ Verification	09.02 Perform required weld preparation. 1 ☐ 2 ☐ 3 ☐ Verification	09.03 Assist welder in weld operation. 1 ☐ 2 ☐ 3 ☐ Verification
09.04 Identify rivet symbol. 1 ☐ 2 ☐ 3 ☐ Verification	09.05 Install proper diameter holes & prepare metal surfaces for riveting. 1 ☐ 2 ☐ 3 ☐ Verification	09.06 Determine whether rivet is to be "shot" or squeezed. 1 ☐ 2 ☐ 3 ☐ Verification
09.07 Perform proper setup & upset rivets. 1 ☐ 2 ☐ 3 ☐ Verification	09.08 Setup & install blind rivets. 1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

10.0 DEMONSTRATE ABILITY TO APPLY GEOMETRIC FORM AND POSITION CONTROL.

10.01 Identify material condition & perfect form. 1 ☐ 2 ☐ 3 ☐ Verification	10.02 Identify the eleven form characteristics. 1 ☐ 2 ☐ 3 ☐ Verification	10.03 Identify the two position characteristics. 1 ☐ 2 ☐ 3 ☐ Verification
10.04 Identify the seven different tolerance zones. 1 ☐ 2 ☐ 3 ☐ Verification	10.05 Identify datum symbols. 1 ☐ 2 ☐ 3 ☐ Verification	10.06 Identify datum planes. 1 ☐ 2 ☐ 3 ☐ Verification
10.07 Identify datum axis. 1 ☐ 2 ☐ 3 ☐ Verification	10.08 Identify datum centerplane. 1 ☐ 2 ☐ 3 ☐ Verification	10.09 Identify the three plane datum system & multiple datums. 1 ☐ 2 ☐ 3 ☐ Verification
10.10 Identify material condition modifiers. 1 ☐ 2 ☐ 3 ☐ Verification	10.11 Solve bonus tolerance applications. 1 ☐ 2 ☐ 3 ☐ Verification	10.12 Solve datum zone applications. 1 ☐ 2 ☐ 3 ☐ Verification
10.13 Identify tolerance value indicator. 1 ☐ 2 ☐ 3 ☐ Verification	10.14 Identify American National Standards Institute. 1 ☐ 2 ☐ 3 ☐ Verification	10.15 Identify International Standards Institute. 1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

11.0 ORGANIZE AND PLAN WORK.

11.01 Interpret blueprints & drawings to acquire proper amount of material. 1 ☐ 2 ☐ 3 ☐ Verification	11.02 Requisition proper tools & equipment to fabricate part. 1 ☐ 2 ☐ 3 ☐ Verification	11.03 Develop a project plan. 1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

0.0 DEMONSTRATE EMPLOYABILITY SKILLS.

0.01 Conduct a job search. 1 ☐ 2 ☐ 3 ☐ Verification	0.02 Secure information about a job. 1 ☐ 2 ☐ 3 ☐ Verification	0.03 Identify documents that may be required when applying for a job. 1 ☐ 2 ☐ 3 ☐ Verification
0.04 Complete a job application form correctly. 1 ☐ 2 ☐ 3 ☐ Verification	0.05 Demonstrate competence in job interview techniques. 1 ☐ 2 ☐ 3 ☐ Verification	0.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other persons. 1 ☐ 2 ☐ 3 ☐ Verification
0.07 Identify acceptable work habits. 1 ☐ 2 ☐ 3 ☐ Verification	0.08 Demonstrate knowledge of how to make job changes appropriately. 1 ☐ 2 ☐ 3 ☐ Verification	0.09 Demonstrate acceptable employee health habits. 1 ☐ 2 ☐ 3 ☐ Verification

00.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP.

00.01 Define entrepreneurship. 1 ☐ 2 ☐ 3 ☐ Verification	00.02 Describe the importance of entrepreneurship to the American economy. 1 ☐ 2 ☐ 3 ☐ Verification	00.03 List the advantages & disadvantages of business ownership. 1 ☐ 2 ☐ 3 ☐ Verification
00.04 Identify the risks involved in ownership of a business. 1 ☐ 2 ☐ 3 ☐ Verification	00.05 Identify the necessary personal characteristics of a successful entrepreneur. 1 ☐ 2 ☐ 3 ☐ Verification	00.06 Identify the business skills needed to operate a small business efficiently & effectively. 1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

P.O.W.E.R. SKILLS (PRINCIPLES OF WORK ENVIRONMENT READINESS)

000.0 COOPERATIVE WORK EXPERIENCE COMPETENCIES.

1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification
1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification	1 ☐ 2 ☐ 3 ☐ Verification

VERIFICATION

The instructor should verify the level of mastery achieved by the student by initialing the competency box each time the student masters a competency. Later, if the student achieves a higher degree of mastery of a competency, the higher degree should be recorded and verified by the instructor.

INSTRUCTOR SHOULD SIGN FULL NAME AND SCHOOL NAME AND ADDRESS IN THE SPACE BELOW.

Verification	Signature
	Title
	School Name
	School Address

Verification	Signature
	Title
	School Name
	School Address

Verification	Signature
	Title
	School Name
	School Address

COOPERATIVE WORK EXPERIENCE

In addition to classroom training and laboratory performance identified on the Career MAP, this student has participated in cooperative work experience with employers as shown below:

Dates _____ Employer _____

Address of Employer _____

Supervisor _____

Supervisor Title _____

Dates _____ Employer _____

Address of Employer _____

Supervisor _____

Supervisor Title _____

Dates _____ Employer _____

Address of Employer _____

Supervisor _____

Supervisor Title _____

NOTES

This section of the MAP is provided so the instructor, employer, or student may list additional qualifying statements or other pertinent information. All comments should be initialed for verification.